Cardiovascular Revascularization Medicine 14 (2013) 270–274

Contents lists available at ScienceDirect

Cardiovascular Revascularization Medicine

Atrial coronary artery occlusion during elective percutaneous coronary angioplasty ☆☆,★,★★

Jesús Álvarez-García *, Miquel Vives-Borrás, Andreu Ferrero, Dabit Arzamendi Aizpurua, Antoni Serra Peñaranda, Juan Cinca

Departament of Cardiology, Hospital de la Santa Creu i Sant Pau, IIb-SantPau, Universitat Autónoma de Barcelona, Barcelona, Spain

ARTICLE INFO

Article history:
Received 26 April 2013
Received in revised form 11 July 2013
Accepted 22 July 2013

Keywords:
Atrial coronary artery
Percutaneous transluminal coronary angioplasty
Stent
Side-branch occlusion

ABSTRACT

Background: Atrial arteries arise from the right and left circumflex coronary arteries and they may be accidentally occluded during percutaneous coronary angioplasty; however, this complication is not well known. The aim of our study was to analyze the incidence and risk factors of accidental atrial branch occlusion (ABO) during elective angioplasty.

Methods and Materials: Clinical records and coronary angiography of 200 patients undergoing elective angioplasty were retrospectively analyzed. Atrial branches were identified and in each vessel we measured the luminal diameter, flow grade, and the location of atherosclerotic plaques. Patients were allocated either into the ABO group if atrial branch flow fell from TIMI grades 2–3 to 0–1 after procedure or in the non-ABO group if TIMI flow was preserved.

Results: Atrial branch occlusion occurred in 43 (21.5%) patients. The atrial branch diameter was larger in non-ABO than in ABO group (1.29 mm, SD 0.33 versus 0.97 mm, SD 0.22, $p = <0.0001$). Plaques at atrial branch origin were present in 93% of ABO group, only in 31.8% of non-ABO ($p \leq 0.0001$). Predictors of ABO were a cut-off vessel diameter of 1.00 mm (ROC 77% sensitivity and 67.5% specificity, $p \leq 0.0001$), the presence of atherosclerotic plaque at the ostium of atrial branch and maximal inflation pressure during stenting.

Conclusions: The occurrence of ABO is frequent after elective angioplasty of right or circumflex coronary arteries in an experienced interventional center. Risk factors were the diameter and the presence of ostial plaques in the atrial branches, and the maximal inflation pressure during stenting.

1. Introduction

Side-branch occlusion (SBO) of coronary arteries arising from an atherosclerotic coronary segment may happen during percutaneous coronary angioplasty (PTCA) [1–3]. Accidental occlusion of atrial coronary branches could also occur after PTCA (see Fig. 1), but the incidence of this complication is unknown. Atrial arteries arise from the right and circumflex coronary arteries and extend through the atrial myocardium to supply both chambers. It is therefore conceivable that PTCA of lesions located at the right or circumflex coronary arteries could lead to an accidental atrial branch occlusion (ABO). However, the incidence and risk factors related to this complication have not been systematically analyzed and only one study reports the incidence of occlusion of sinus node artery in patients undergoing right coronary angioplasty [4]. The clinical relevance of ABO is not well established. There is indirect evidence from clinical and necropsic studies [5–11] to support the hypothesis that, like it occurs during ventricular myocardial ischemia [12–14], atrial myocardial ischemia secondary to ABO might lead to mechanical atrial dysfunction, increased electrical vulnerability to atrial arrhythmias, and late structural remodeling.

The aim of our study was to analyze the incidence of accidental ABO during elective PTCA of the right and circumflex coronary arteries in an experienced coronary interventional center. Moreover, we compare the clinical profile and technical procedural characteristics in patients with and without accidental ABO after elective PTCA.

2. Materials and methods

2.1. Study population

From a total number of 2149 PTCAs performed between January 1, 2009 and February 28, 2011 in our institution, we retrospectively

☆☆ All authors takes responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

★ All authors report no conflict of interest.

★★ This study was supported in part by grants from Spanish Fundació Marató TV3, Barcelona, Spain (Grant No. 080630-2007) and Redes Temáticas de Investigación Cooperativa en Salud del Instituto de Salud Carlos III (REDINSCOR), Madrid, Spain (Grant No. RD06-0003-0000).

* Corresponding author. Department of Cardiology, Hospital de la Santa Creu i Sant Pau, St. Antoni M. Claret, 167, 08025, Barcelona, Spain. Tel.: +34 935565940; fax: +34 935565603.
E-mail address: jalvarezg@santpau.cat (J. Álvarez-García).

1553-8389
http://dx.doi.org/10.1016/j.carrev.2013.07.007

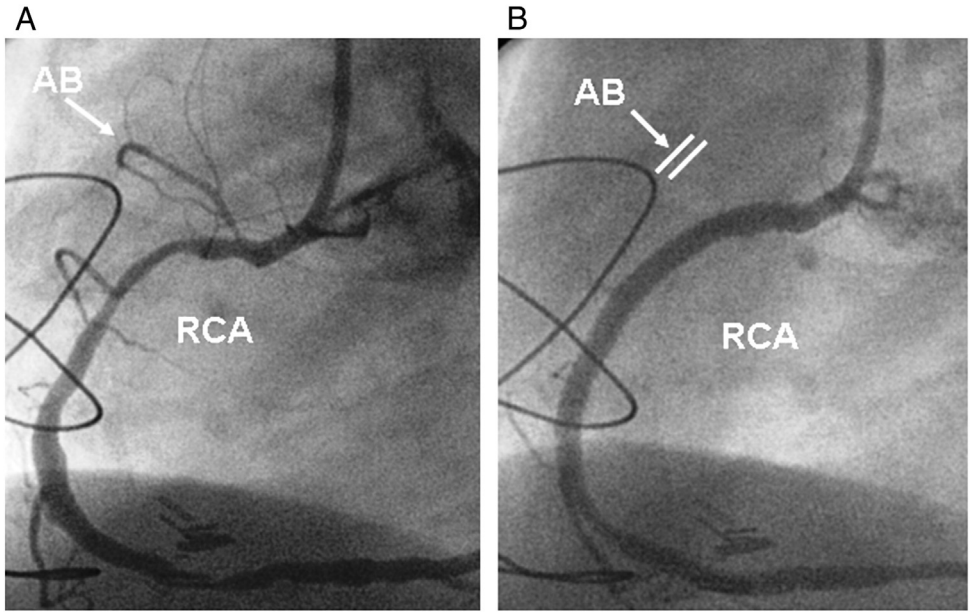

Fig. 1. An illustrative case of atrial branch occlusion after elective percutaneous transluminal coronary angioplasty. Panel A shows an atrial branch (Ab) arising from the proximal segment of the right coronary artery (RCA), before the intervention. Panel B shows occlusion of the atrial branch after stent implantation in the RCA.

reviewed the 845 consecutive elective procedures involving the right and circumflex coronary arteries. Therefore, we finally include the 200 patients in whom the placement of the stent could interfere the atrial branch flow. This could happen when a) the treatment of target lesion forces to place the stent across the origin of atrial artery, or b) the distance between the extreme of the stent and the origin of atrial branch is less than or equal to 5 mm assessed by Quantitative Coronary Assessment (QCA) software (Philips Allura Xper FD 10). In order to facilitate the use of our data in future prospective studies addressed to determine the clinical consequences of isolated atrial ischemia, patients submitted to PTCA in the setting of acute myocardial infarction were not included.

2.2. Study protocol

All patients were admitted to the hospital at least 1 day before the intervention. In all cases the clinical history, physical examination, 12-lead ECG, routine blood test, and myocardial markers were collected retrospectively whenever available. We also registered the type of vascular access, the indication for angioplasty, the need for predilatation or postdilatation, and the characteristics of the implanted stent. All patients gave written consent prior to coronary intervention.

2.3. Angiographic analysis

Coronary angiography was reviewed by two interventional cardiologists. All frames were calibrated with the tip of the catheter as a reference guide before contrast injection. Two orthogonal projections were used before and after stent implantation. Whenever a patient had two or more atrial branches arising from the same coronary artery, we selected for this study the largest branch. In each coronary segment, we measured the luminal diameters and the percentage of stenosis using the QCA. The coronary artery flow was qualitatively evaluated using the TIMI score [15]. Patients were divided into two groups according to the loss or preservation of the AB flow at the end of angioplasty. ABO group were those patients in whom the AB flow fell from TIMI grades 2–3 to 0–1 after the procedure. Non-ABO group were those patients in whom the baseline TIMI was normal and did not change after PTCA. We also evaluated the length of the coronary lesion and the plaque composition characteristics according to the American College of Cardiology/American Heart Association (ACC/AHA) classification [16]. In each AB, we specifically analyzed the presence of atherosclerotic plaques, maximal luminal diameter, and TIMI flow before and after the PTCA. To assess the spatial relationship between the location of the target atherosclerotic plaques for PTCA and the output of the AB, we followed the Medina's classification [17].

2.4. Data analysis

Due to the variety of stent models implanted in this series of patients, the influence of a given model on ABO could not be specifically analyzed and therefore we created the variable "Bare-metal stent (BMS) versus drug-eluting stent (DES)" to asses statistical differences.

Descriptive analyses were performed at the first step. Categorical variables were described by frequencies and percentages and statistical differences were analyzed using a 2×2 table test and the χ^2 test. Continuous variables were described by the mean $\pm$ standard deviation and statistical differences were analyzed using the Student's t test in the case of a normal distribution. A multivariable logistic regression model was performed, adjusting for the covariates statistically significant at the univariable analysis (p value less than 0.20 as a criterion of entry into multivariate analysis), to identify independent predictors of ABO. A forward step method was used to define the final model and the independent predictors of ABO. Additionally, the final model was adjusted for those variables categorized as clinically relevant. Significant predictors of ABO were expressed in terms of odds ratio and 95% confidence intervals (CIs). To assess the model's predictive ability of our data, we calculated the area under the receiver operating characteristics following a nonparametric distribution assumption. A p value less than 0.05 was considered statistically significant. For all calculations we used the software SPSS for Windows (IBM, SPSS Statistics, 19 version).

3. Results

Accidental ABO after elective PTCA occurred in 43 (21.5%) of 200 patients in this study.